

(No Model.)

2 Sheets—Sheet 1.

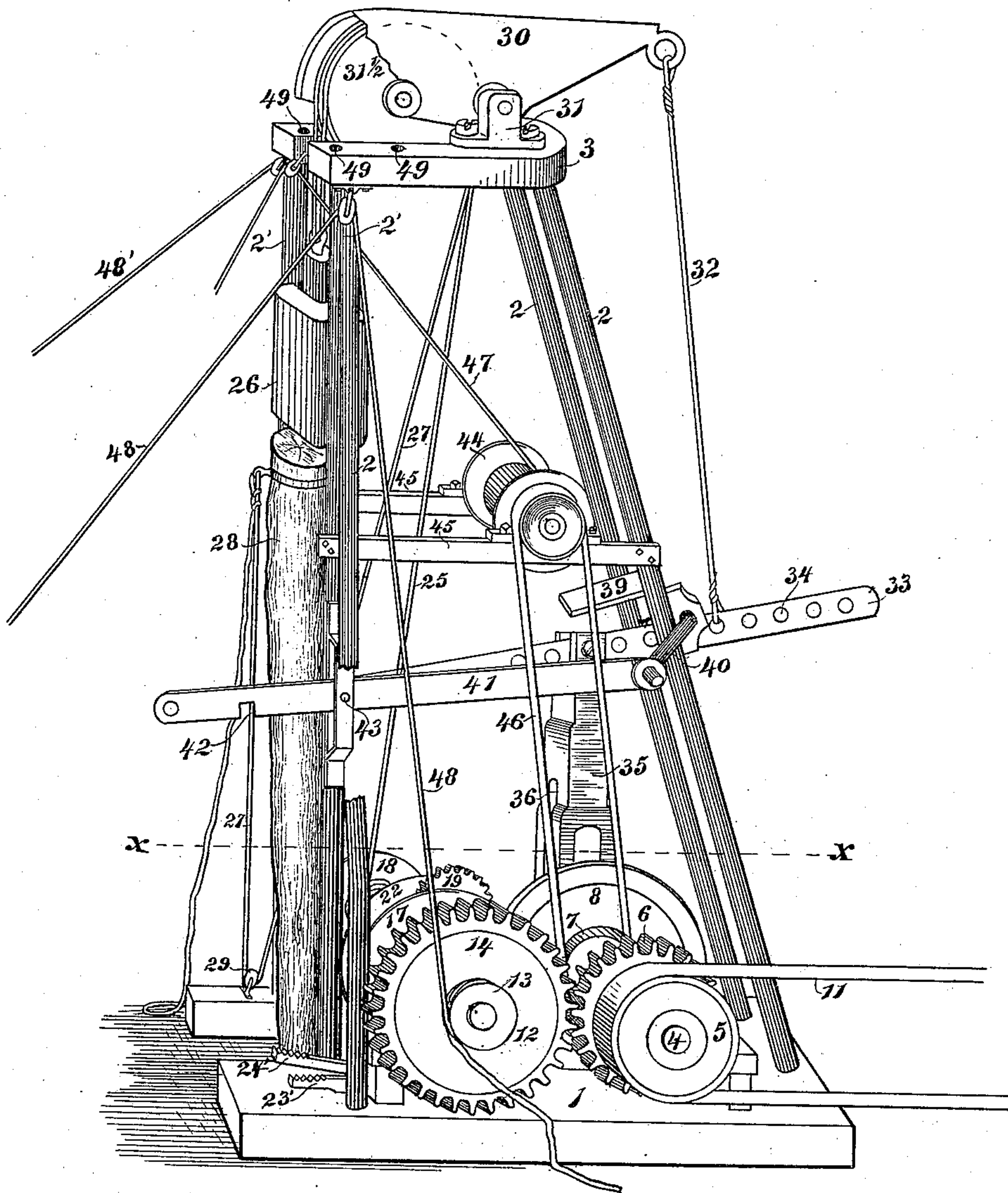
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COMBINED PILE DRIVING AND WELL DRILLING MACHINE.

No. 376,474.

Patented Jan. 17, 1888.

FIG. 1.



Witnesses.  
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FIG. 2.

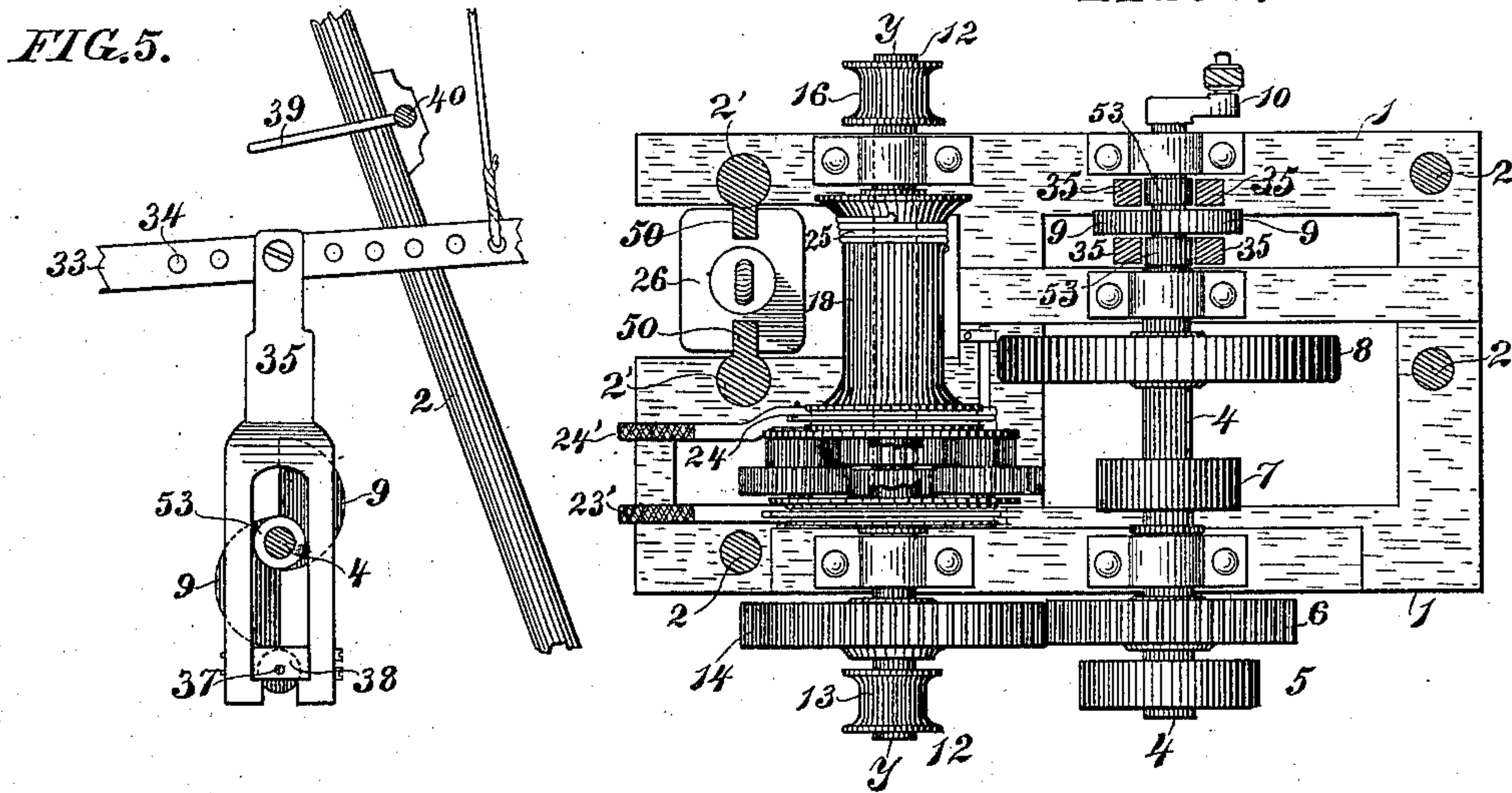


FIG. 5.

FIG. 6.

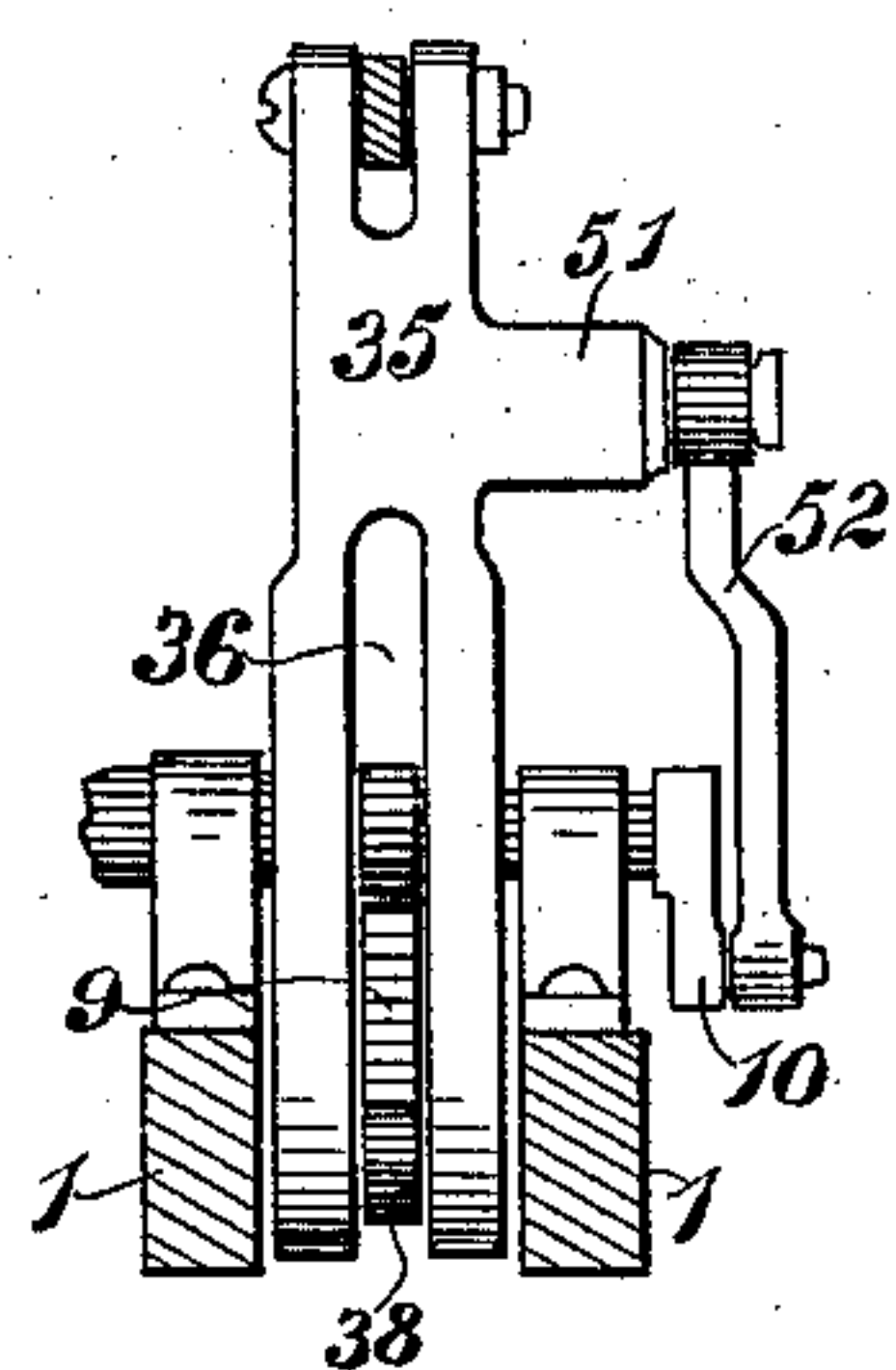


FIG. 3.

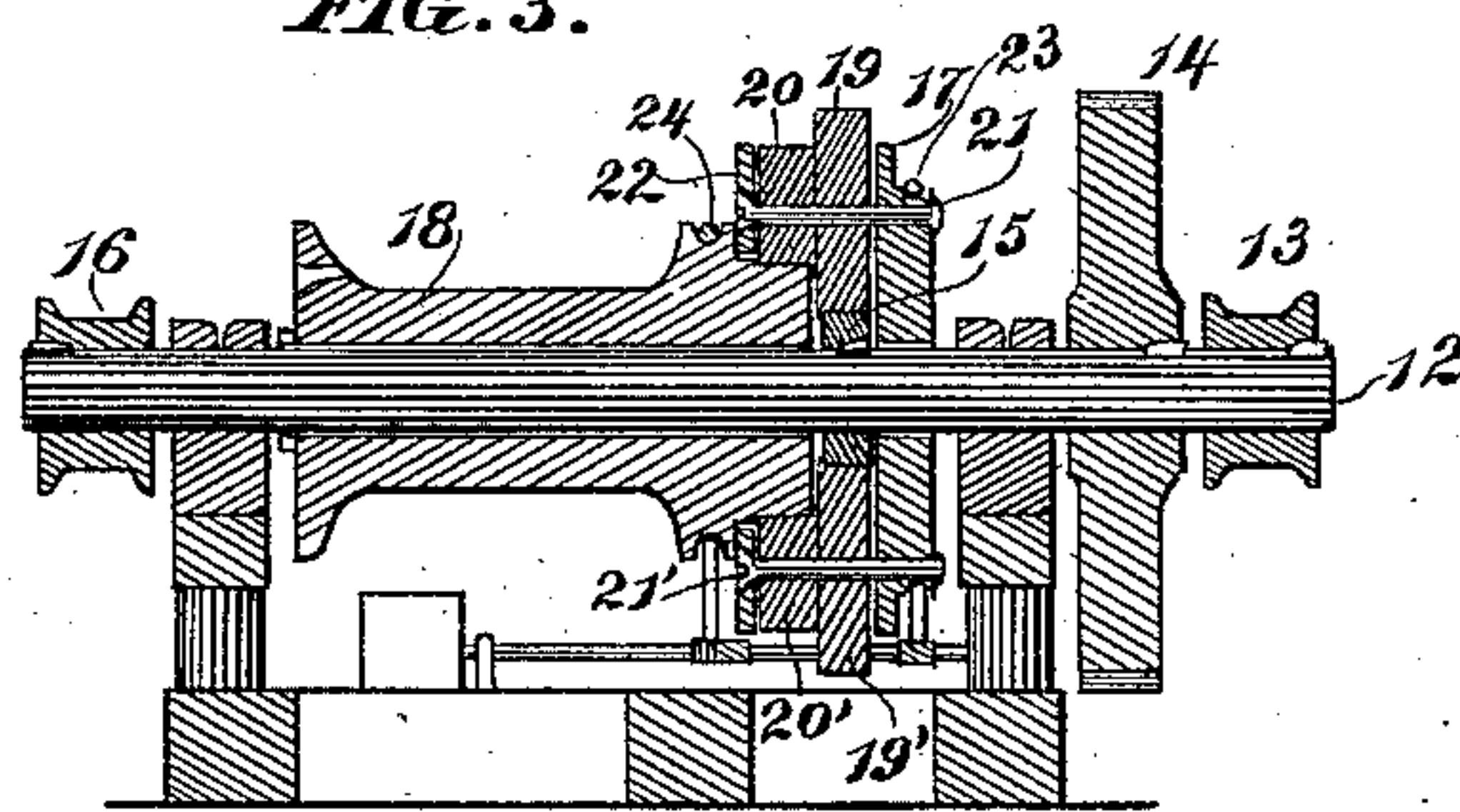


FIG. 7.

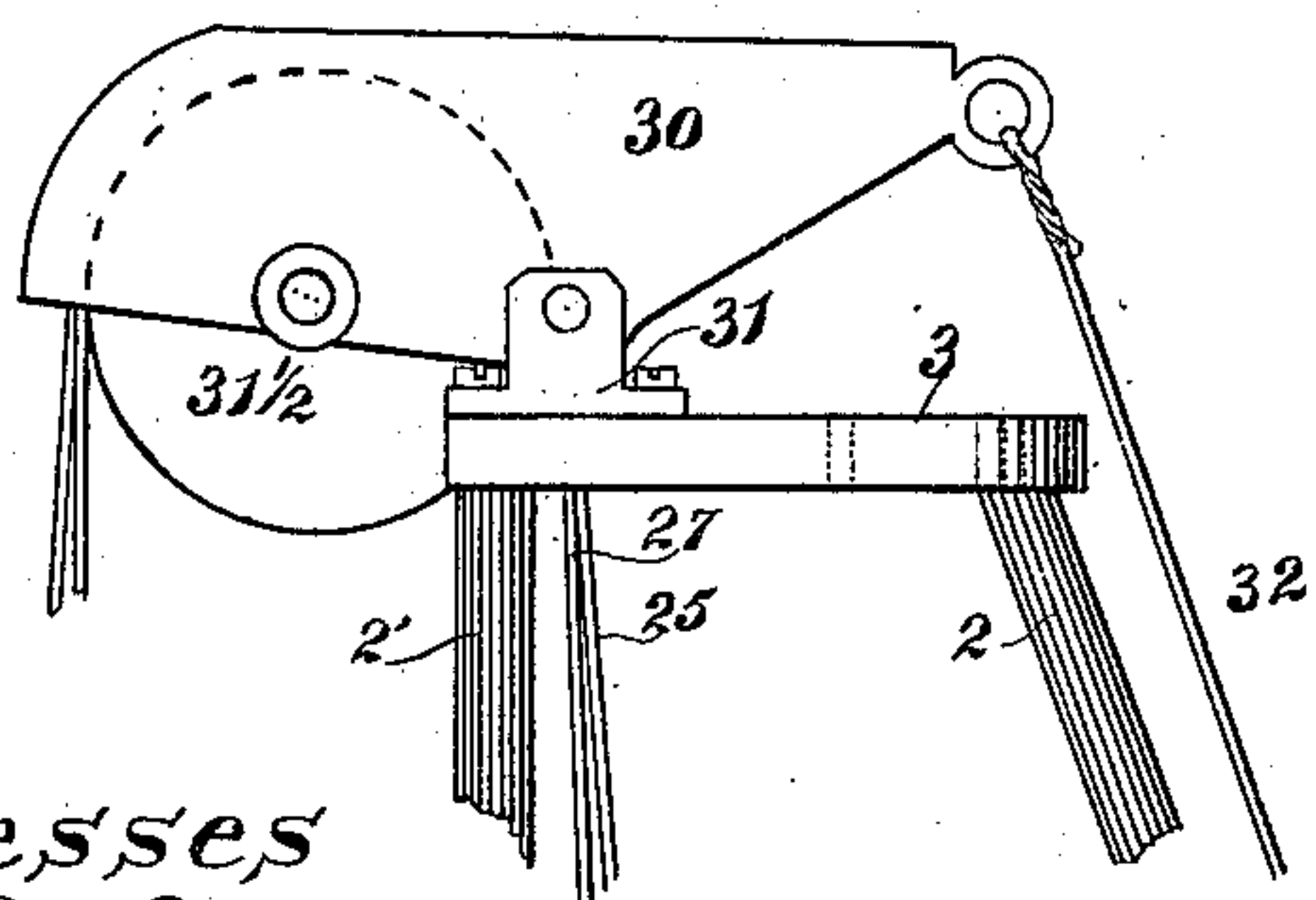
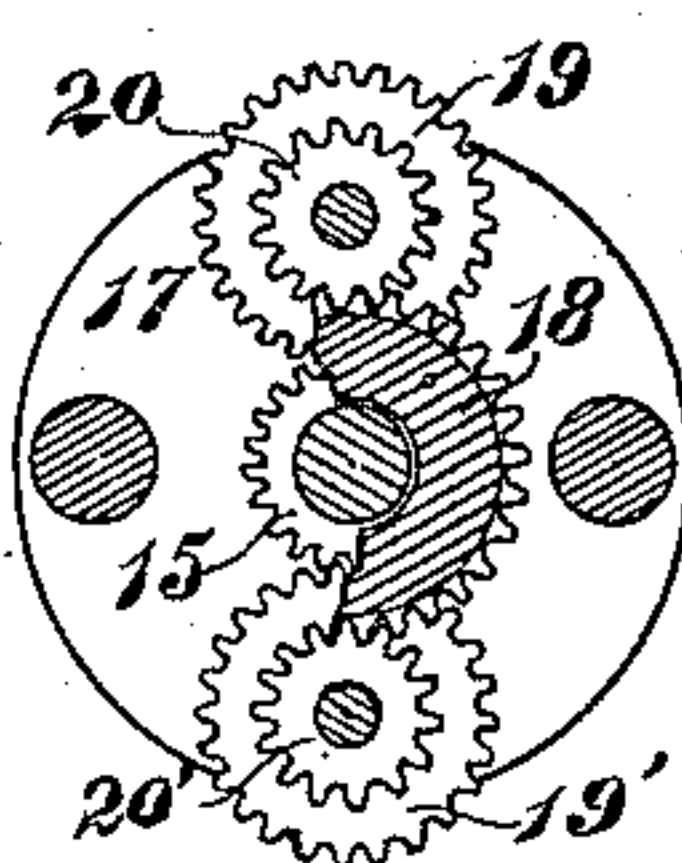


FIG. 4.



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# UNITED STATES PATENT OFFICE.

FRANK M. GRAY, OF MILWAUKEE, WISCONSIN.

## COMBINED PILE-DRIVING AND WELL-DRILLING MACHINE.

SPECIFICATION forming part of Letters Patent No. 376,474, dated January 17, 1888.

Application filed March 10, 1887. Serial No. 230,367. (No model.)

*To all whom it may concern:*

Be it known that I, FRANK M. GRAY, of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented a new and useful Combined Pile-Driving and Well-Drilling Machine; and I do hereby declare the following to be a full, clear, and exact description of said invention, reference being had to the accompanying drawings, and to the letters or figures of reference marked thereon, which form a part of this specification.

My invention is in the form and construction and peculiar combination and location of the various parts of my mechanism.

In the drawings, Figure 1 is a perspective view of my entire machine, parts being broken away to show interior parts more fully. Fig. 2 is a plan of the mechanism below line *xx* of Fig. 1, and containing also the pile-driving weight in cross-section. Fig. 3 is a vertical longitudinal section on line *yy* of Fig. 2. Figs. 4, 5, 6, and 7 are details.

The same figures refer to like parts in all the views.

1 1 are the sills, 2 2' 2' are the posts, and 3 is the top plate, of the derrick or tower. A driving-shaft, 4, is supported in bearings on short posts rigid on the sills 1 1. Rigid on this shaft and rotating therewith are a driving-pulley, 5, a spur-wheel, 6, a band-pulley, 7, a fly-wheel, 8, a pair of cam-arms, 9 9, and a crank, 10. The power-supplying mechanism is connected with this machinery by means of a belt, 11, running upon the driving-pulley 5. A second shaft, 12, also supported in bearings on short posts rigid on the sills 1 1 and parallel with driving-shaft 4, carries on it rigidly a winch, 13, a spur-wheel, 14, meshing with spur-wheel 6, pinion 15, and winch 16. There are also supported and rotating on this shaft independently thereof a grooved brake-wheel, 17, and a windlass-drum, 18. Supported on the side of the brake-wheel 17, near its outer edge, are two sets of two pinions each, 19 and 20 and 19' and 20', each of which sets 19 and 20 and 19' and 20' are supported on the same arbor rigid to brake-wheel 17. The ends of these arbors or axles 21 and 21' opposite to the end supported in the brake-wheel 17 are supported and held in position in a plate-ring riding around on the end of the windlass-drum

18. The pinions 19 and 19' mesh with pinion 15 on the shaft 12, and pinions 20 and 20' mesh with teeth on periphery of the end of the windlass-drum 18. A rope or band, 23, is affixed at one end of the sill 1 and passes over the brake-wheel 17 in a groove therefor in its periphery, and at the other end is attached to a pedal, 23', near its center, which pedal is pivoted at its inner end to the sill 1. This band and pedal, 23 and 23', are adapted to act as a brake, whereby, the pedal being forced down at its outer end, the band will by friction hold the brake-wheel 17 rigidly in position, prohibiting its rotating. A band, 24, attached at one end to the sill 1 and running in a groove over the windlass-drum 18, is attached to the pedal 24' centrally, which pedal is pivoted at one end to the sill 1, this band and pedal being adapted, upon forcing the outer end of the pedal downward, to act as a brake on the windlass-drum and hold it against rotation.

It will be understood that as shaft 12 rotates, the pinions 19 and 19' are also caused to rotate, and the pinions 20 and 20', being integral with pinions 19 and 19', respectively, will also rotate with them, and that if the brake-wheel 17 is free to revolve it will thereby be rotated around the shaft 12, but that if the brake-wheel 17 be held rigidly against rotating by the brake 23, then, as the pinions 19 and 20 rotate, the windlass-drum 18 will be caused to revolve about the shaft 12. A cable, 25, affixed at one end to and winding on the windlass-drum 18 runs up over a sheave in the walking-beam, and at its other end carries the weight 26 when the machine is used as a pile-driver, or the drilling-tools when the machine is used for well-drilling.

The weight 26, or drill-tools, supported on the cable 25, may be raised or lowered, as desired, by winding the cable on the windlass-drum 18, whereby the weight or tools are raised, and by releasing the windlass from brake 24, when the gravity of the weight or tools will carry them down.

When used as a pile-driver, a cable, 27, is used, attached at one end to the upper end of the pile 28, and is carried down around a sheave, 29, attached to the sill 1, and up over the sheave in the walking-beam, and at the other end is attached to and supports the weight



26. This cable 27 may be used with or independently of the cable 25; or when both are attached to the weight 26 the cable 25 should, after the weight is once in position, be relaxed, whereby as the pile is driven into the ground the weight will automatically continue its position relatively to the pile. It is believed that this device, including the cable 27 and the parts to which it is connected and with and on which it acts, is a novel invention; but as it has no application in well-drilling mechanism I do not make any claim for it in this application, but reserve the right to apply for a patent for it in a separate application. A walking-beam, 30, is pivoted and supported centrally in bearings 31, located adjustably on the top of plate 3. The walking-beam 30 has in one arm a sheave, 31 $\frac{1}{2}$ , so located with reference to the pivotal point of the walking-beam that the axis of the cable running over the sheave passes centrally transversely through the pivotal axis of the walking-beam. The sheave 31 $\frac{1}{2}$  is provided with two grooves about its periphery for the cables 25 and 27, respectively. Two single sheaves, side by side on the same axle, might be used instead of the sheave 31 $\frac{1}{2}$  with its two grooves. The other arm of the walking-beam is connected by a rod, 32, to one end of the oscillating lever 33 in any one of the series of apertures, 34, therefor in said lever, whereby the extent of the movement of the rod 32 and walking-beam may be regulated. The lever 33 is pivoted at its inner end to one of the supporting-posts 2. A pitman, 35, is pivoted at its upper end to the lever 33, and may be adjustably secured thereto by pivoting it in any one of the series of apertures 34. The lower end of this pitman is bifurcated, the two arms thereof passing on opposite sides of the shaft 4 and being guided thereby. The slot 36 is provided in the bifurcated arms of this pitman, within which the cam-arms 9 revolve. The cam-arms 9 have on one side in the line of their motion an eccentric periphery curving from near the shaft on which they are supported to the outer extremity of the arms, and from that point retreating or being recessed to near the shaft again. The outer extremities of these cam-arms are located on opposite sides of the shaft and diametrically opposite to each other. These cam-arms are adapted to bear against a pin, 37, carrying an anti-friction wheel thereon, 38, in the lower end of the pitman 35, and thereby to force the pitman down, the pitman being alternately raised when released from the cam-levers by the gravity of the weight 26 or the drill-tools. A swinging key, 39, rigid on the axle of a crank, 40, having its bearings in brackets on the posts 2 2', is adapted to lock the lever 33 when desired. A latch, 41, is connected to the outer end of the crank 40, and is provided with notches 42, adapted to engage a pin, 43, in a bracket on post 2'. By drawing this latch 41 to the front, as shown in Fig. 1, the key 39 is released from

the lever 33, and by releasing it from the pin 43 and pushing it to the rear the key 39 is turned down against the lever 33 and prohibits its oscillation. A second windlass, 44, is supported and rotates in bearings on cross-beams 45, which cross-beams are affixed to the posts 2 2'. This windlass 44 is operated by a belt, 46, running over it and upon band-pulley 7 on the driving-shaft. A cable, 47, is affixed at one end to this windlass 44 and runs over a sheave attached to plate 3, which cable is adapted for withdrawing the sand-pump from the well or other similar purposes. Cables 48 and 48', running on the winches 13 and 16, respectively, also run over sheaves supported on plate 3, and are adapted for hauling piles from a distance to the machine, and for other similar purposes. When the machine is used for well-drilling, the walking-beam is carried farther to the front of the machine by removing the bearings 31 from the position shown in Fig. 1 to the front of the plate 3, and securing the bearings at that point to the plate 3 by inserting the bolts therefor in the apertures 49 49', as shown in Fig. 7.

The weight 26 is guided in its movement up and down by guide-rails 50 50', rigid on the posts 2' 2', which rails enter grooves therefor in the weight 26. The pitman 35 has rigid thereon a stud, 51, carrying pivoted thereto a removable short pitman, 52, which pitman 52 at its other end is pivoted to the outer end of a crank-arm, 10. This crank-arm 10 is half the length of the line of the vertical movement of the pitman 35, so that the diameter of its circular motion is equal to the length of one of the cam-arms 9. This pitman 52 is for use only when it is desired to obviate a too sudden upward movement of the pitman 35 under the force of the gravity of the weight of the drill-tools.

It will be understood that the reciprocating movement of the pile-driving weight or drill-tools is secured and permitted by and through the oscillating movement of the walking-beam.

To provide against friction and to secure a smoother and steadier motion of the pitman 35 reciprocally, loose sleeves or rings 53 53 are placed about the shaft 4 within the bifurcated arms of the pitman.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a well-drilling or pile-driving machine, a tower or derrick and thereon a walking-beam, 30, adjustable to front or rear in bearings movable thereon, substantially as described.

2. In well-drilling mechanism, a rotating shaft, 12, and rigid pinion 15 thereon, in combination with brake-wheel 17, the thereon carried pinions 19 20 and 19' 20', and the windlass-drum 18, provided with spur-teeth meshing with pinions 20 20', substantially as described.

3. In well-drilling mechanism, a pitman, 35, and the two therewith impinging cam-arms 9



9, supported and rotating with shaft 4, in combination with shaft 4, sub-pitman 52, and crank-arm 10, also rotating with shaft 4, constructed as described, substantially as and for  
5 the purpose set forth.

4. In well-drilling mechanism, a pitman, 35, provided with bifurcated arms straddling a shaft, 4, and with a bearing-pin, 37, and anti-friction wheel 38, in combination with shaft

4, cam-arms 9 9, and anti-friction sleeves 53 53, 10 substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

FRANK M. GRAY.

Witnesses:

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O. L. HOFFMANN.